

A NEW POLYCHELATE SHRIMP
FROM THE GREAT BARRIER REEF OF AUSTRALIA
AND ITS BEARING ON THE FAMILY BRESILIIDAE
(CRUSTACEA: DECAPODA: CARIDEA)

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Abstract.—*Pseudocheles enigma*, a new genus and species of marine caridean shrimp characterized most remarkably by the presence of functional chelae on all 5 pairs of pereopods, is recorded from Lizard Island, Queensland, Australia. Because it displays characters associated with both of the families Disciadidae and Bresiliidae, the former is subjectively synonymized with the latter in order to accommodate the species with least disruption of currently accepted concepts of caridean classification.

The shrimp described below offers fresh evidence that many still undescribed species must be discovered before a definitive classification of the decapod Crustacea of the world can be attempted. When Holthuis published his invaluable review of the genera of caridean shrimps in 1955, all of the more than 1,500 species then known were characterized by the presence of one or, usually, two pairs of chelate pereopods. Except for prehensile, subchelate posterior pereopods in a few species, there were no exceptions to this established pattern. During the less than a quarter-century since the appearance of that work, however, two species without any chelate appendages—*Procaris ascensionis* Chace and Manning, 1972, and *P. hawaiana* Holthuis, 1973—have been discovered on Ascension Island and in Hawaii, and now the Great Barrier Reef has contributed a species in which all five pereopods are functionally chelate. The pincers on the three posterior pairs of pereopods of the Australian shrimp are not true chelae and therefore are perhaps not of genuine familial significance, but other characteristics, especially of the mouthparts, have thwarted all attempts to accommodate the species in the currently conceived classification of the Caridea.

We are most grateful to the staff of the Fish Department of The Australian Museum, particularly Helen Larsen and D. F. Hoese, for collecting this unusual shrimp and making the specimens available to us. We thank Raymond B. Manning for participating in discussions relating to the systematic problem posed by this discovery as well as for reviewing the manuscript. Horton H. Hobbs, Jr., also suggested welcome ways to improve the paper.

Genus *Pseudocheles*, new genus

Diagnosis.—Rostrum compressed laterally in anterior half, with narrow supraorbital eaves posteriorly, armed with series of dorsal teeth and 1 small tooth on ventral margin. Carapace with antennal spine, without branchiostegal or pterygostomial spines. Telson armed with 3 pairs of dorsolateral spines and 3 pairs of posterior spines, posterior margin acutely triangular. Antennal scale narrowing distally, blade not overreaching distolateral tooth. Mandible with 2-segmented palp, without distinct separation between incisor and “molar” processes. Second maxilla with endites bearing long, stout setae, distal lobe strapshaped and directed distally. First maxilliped without exopodal lash. Second maxilliped with terminal segment attached transversely to preceding segment. Third maxilliped conventional, distal segment not flattened. First and 2nd pereopods with ischium and merus fused. First pereopod more robust but no longer than 2nd, fingers elongate, carpus broader than long, partially recessed in hollowed end of merus. Three posterior pairs of pereopods spuriously chelate. Exopods on all 5 pairs of pereopods. Gills on pereopodal somites represented by pleurobranchs only.

Type-species.—*Pseudocheles enigma*, new species.

Etymology.—From the Greek, “pseudos,” falsehood, and “chele,” claw, in reference to the false chelae on the 3 posterior pairs of pereopods. The gender is feminine.

Pseudocheles enigma, new species

Figs. 1-4

Material.—Bommie (reef) No. 2, west side of lagoon, Lizard Island, Queensland, Australia; 1-15 m; 17 November 1975; Sta. LZ 75-42: 1 female holotype (Australian Museum P. 24190), 2 ovigerous female paratypes (AM P. 26830).

Description.—Integument thin but not fragile. Rostrum (Fig. 2a, b) reaching nearly to level of distal end of 2nd segment of antennular peduncle (Fig. 1), dorsal margin thin, armed with 6 equidistant teeth on rostrum proper, lateral carinae forming narrow supraorbital eaves widening posteriorly, ventral margin armed with single minute tooth situated about midway between anteriormost dorsal tooth and apex of rostrum. Carapace with denticle in dorsal midline on posterior slope of posteriormost tooth of true rostral series, followed by rather prominent tooth situated about as far posterior to 1st rostral tooth as distance between 1st and 4th rostral teeth, and acute denticle at about posterior $\frac{1}{4}$ of carapace length; antennal spine distinct, arising just ventral to broadly rounded ventral orbital lobe; latter bent mesially and forming horizontal shelf beneath eye (Fig. 2b).

Abdomen of female (Fig. 1) with pleura of 2 anterior somites quite

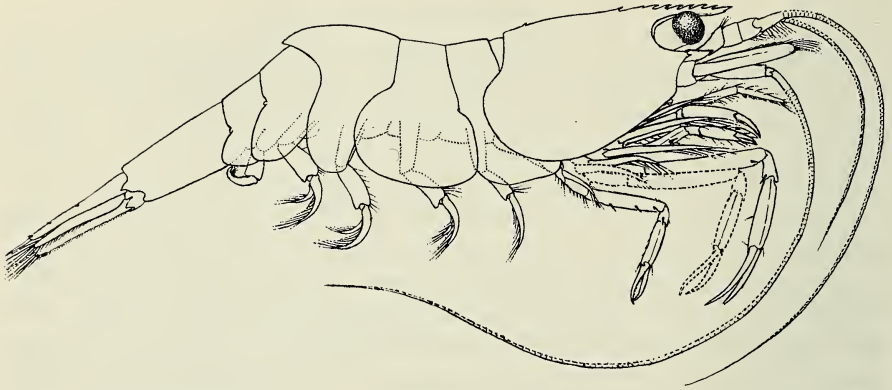


Fig. 1. *Pseudocheles enigma*, female holotype $\times 9$.

broadly rounded, of 3 following somites narrowly rounded, 3rd somite projecting as low cap over anterior part of 4th somite. Sixth somite more than $2\frac{1}{2}$ times as long as 5th and about twice as long as high. Telson (Fig. 2c), not including posterior spines, about as long as 6th somite, about 4 times as long as anterior width, armed with 3 pairs of dorsolateral spines, anterior pair situated at about midlength of telson, posterior pair overreaching bases of lateral pair of posterior spines; posterior margin (Fig. 2d) subtriangular, armed with 3 pairs of long spines, lateral pair sinuous and about 3 times as long as subequal submedian and intermediate pairs; posteromedian part (Fig. 2e) with pair of setae arising from dorsal surface and armed with sharp median point posteriorly.

Eye (Fig. 2b) with cornea well-pigmented, fully as long as stalk, and having pebbly appearance because of rather markedly convex *square* facets.

Antennular peduncle (Fig. 2f) reaching about to distal $\frac{1}{3}$ of antennal scale; stylocerite tapering to acute tip reaching about level of distal $\frac{1}{3}$ of basal segment of otherwise unarmed peduncle; basal segment of peduncle twice as long as 2nd and about $1\frac{2}{3}$ times as long as 3rd, all measured on mesial margins. Dorsolateral flagellum about $3\frac{1}{2}$ times as long as carapace; ventromesial flagellum less than twice as long as carapace.

Antennal scale (Fig. 2g) slightly more than 3 times as long as wide, distolateral tooth small, barely overreaching rounded distal margin of blade. Antennal peduncle unarmed, reaching to about distal $\frac{1}{3}$ of scale. Flagellum nearly 5 times as long as carapace.

Mandibles (Fig. 3a, b) similar, with robust 2-segmented palp, incisor process extensive, armed with 10 marginal teeth, "molar" process small, not distinctly separated from incisor process, consisting of spinose lobe with row of spines extending laterally on anterodorsal surface. First maxilla (Fig. 3c) with proximal endite distally rounded, bearing about 9 long setae

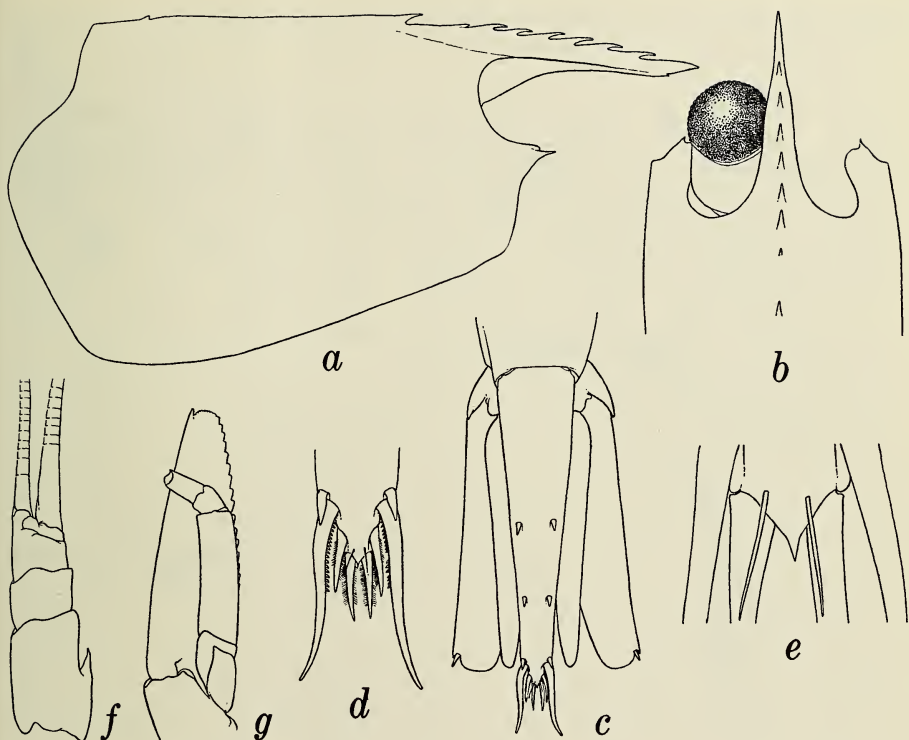


Fig. 2. *Pseudocheles enigma*, ovigerous female paratype, carapace length 2.1 mm: *a*, Carapace, including rostrum; *b*, Frontal region, dorsal aspect; *c*, Telson and uropods; *d*, Posterior end of telson; *e*, Same, more highly magnified; *f*, Right antennule, dorsal aspect; *g*, Right antenna, ventral aspect. (*a-c*, *f*, *g*, $\times 25$; *d*, $\times 62$; *e*, $\times 260$.)

along distal margin and about 6 spines, increasing in length mesially, on proximal and mesial margins; distal endite armed with 6 stout spines and few smaller ones on mesial margin; palp bifurcate, with long distal spine on proximomesial branch and single subdistal seta on distal branch. Second maxilla (Fig. 3*d*) with 2 proximal endites represented by rather narrow lobes directed mesiodistally, distal endite strapshaped, directed distally subparallel with palp and bearing 3 long, mesially curved setae extending far beyond palp; scaphognathite rather broad and short, barely overreaching strong palp. First maxilliped (Fig. 3*e*) with subquadrate endite, slender palp, exopod terminating in slight projection perhaps representing vestigial lash, and large, bilobate epipod. Second maxilliped (Fig. 3*f*) somewhat pediform, distal segment bearing 5 stout spines, one at flexor angle of distal margin bearing subacute tubercles arranged in 2 rows (Fig. 3*g*); exopod rather short, barely overreaching antepenultimate segment. Third

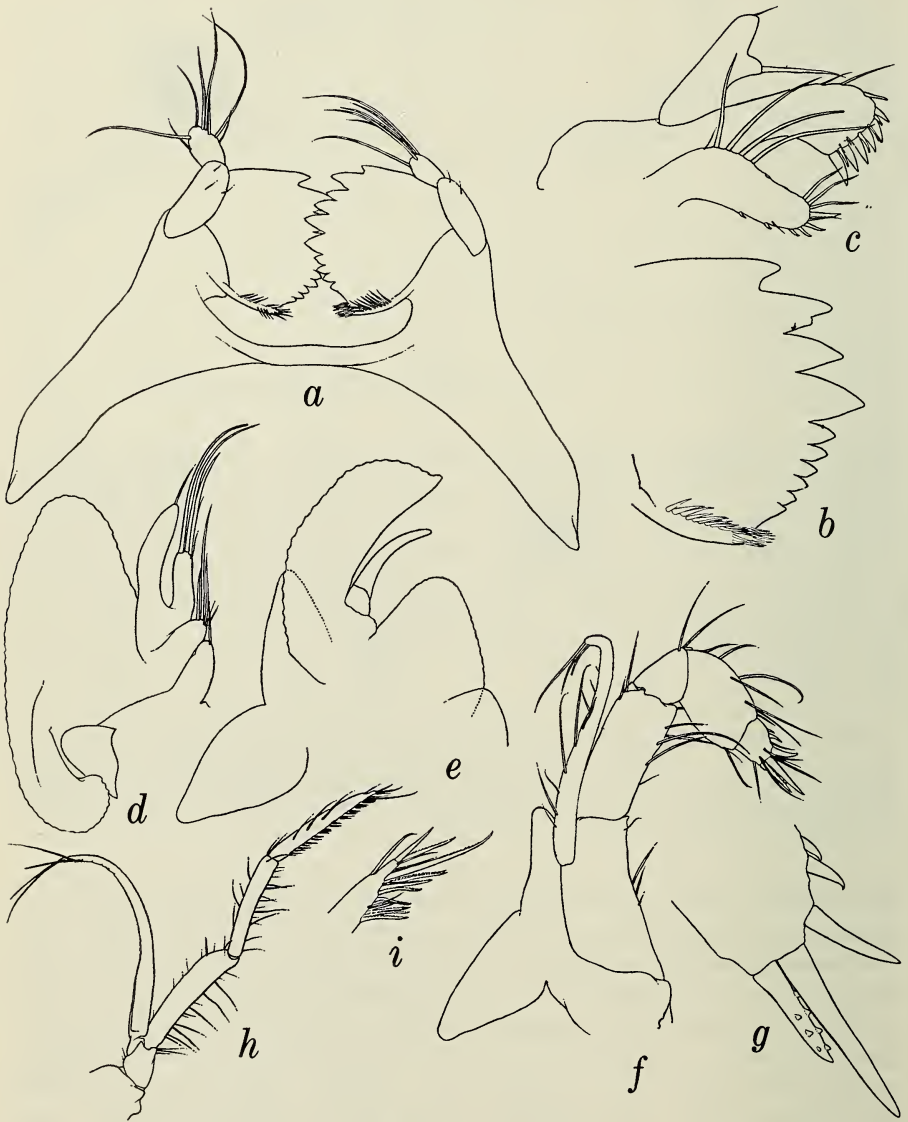


Fig. 3. *Pseudocheles enigma*, ovigerous female paratype, carapace length 2.1 mm: a, Mandibles, anterodorsal aspect; b, Opposable margin of left mandible; c, Right 1st maxilla; d, Right 2nd maxilliped; e, Left 2nd maxilliped; f, Right 1st maxilliped; g, Same, distal spines; h, Right 3rd maxilliped; i, Same, distal end. (h, $\times 25$; a, c-f, i, $\times 62$; b, $\times 130$; g, $\times 260$.)

maxilliped (Fig. 3*h*) slender, 5-segmented, reaching nearly to level of distal end of antennal scale; distal end of terminal segment constricted into rod-like tip (Fig. 3*i*).

First pereopod (Fig. 4*a*) reaching nearly to level of distal end of antennal peduncle; fingers (Fig. 4*b*) slender, curving toward flexor margin, about $\frac{2}{3}$ as long as palm, tips crossing slightly when flexed, dactyl obscurely dentate on opposable margin; palm rather stout, slightly carinate on extensor margin; carpus fully twice as wide as long, partially recessed in distal end of merus when extended; ischiomerus with longitudinal carina; exopod well-developed, reaching to about midlength of palm. Second pereopod (Fig. 4*c*) about as long as 1st but more slender; fingers (Fig. 4*d*) slightly more than $\frac{1}{2}$ as long as palm, opposable margins bearing movable spines or stout setae; palm not noticeably carinate; carpus about $\frac{1}{2}$ as long as chela, slightly longer than wide; ischiomerus with longitudinal carina and single stout spine in distal $\frac{1}{4}$ of flexor margin; exopod reaching end of proximal $\frac{1}{3}$ of palm. Three posterior pairs of pereopods with curved dactyl opposing subequally long, curved spine arising from distal end of propodus to form pincers resembling those found on 2 anterior pereopods of pasiphaeid shrimps, resemblance enhanced by pectinations on opposable margin of dactyl (Fig. 4*i*, *j*) and close-set series of spinules on opposable margin of seta (Fig. 4*k*). Third pereopod (Fig. 4*e*) overreaching antennal scale by length of dactyl and most of propodus; dactyl (Fig. 4*f*) slightly shorter than propodus; carpus fully $\frac{1}{3}$ as long as propodus, armed with pair of spines near distal end of flexor margin; merus $1\frac{2}{3}$ times as long as propodus, armed with 4 strong spines on or near flexor margin; ischium about $\frac{2}{3}$ as long as merus, armed with single strong marginal spine; exopod overreaching proximal $\frac{1}{4}$ of merus. Fourth pereopod (Fig. 4*g-k*) overreaching antennal scale by length of dactyl and about $\frac{1}{4}$ of propodus; dactyl fully as long as propodus; carpus less than $\frac{1}{2}$ as long as propodus, armed with stout spine near distal angle of flexor margin; merus twice as long as propodus, armed with 6 strong spines on or near flexor margin; ischium about $\frac{2}{3}$ as long as merus, armed with 2 strong marginal spines; exopod nearly reaching end of proximal $\frac{1}{4}$ of merus. Fifth pereopod (Fig. 4*l*, *m*) reaching approximately to level of distal $\frac{1}{4}$ of antennal scale; dactyl about as long as propodus; carpus less than $\frac{1}{2}$ as long as propodus, armed with stout spine; merus about $1\frac{1}{3}$ as long as propodus, armed with 4 strong spines on or near flexor margin; ischium $\frac{1}{2}$ as long as merus, armed with 4 marginal spines; exopod reaching end of proximal $\frac{1}{3}$ of merus.

Uropod (Fig. 2*c*) with branches subequal in length, reaching slightly beyond base of triangular endpiece of telson, lateral branch with movable spine mesial to distolateral tooth.

Eggs with late embryos oval, measuring about 0.4×0.3 mm.

Size.—Female holotype with carapace length of 2.2 mm (total length



Fig. 4. *Pseudocheles enigma*, female holotype: a, Right 1st pereopod; b, Same, fingers; c, Right 2nd pereopod; d, Same, fingers; e, Right 3rd pereopod, remotor aspect; f, Same, dactyl and distal propodal spines, promotor aspect; g, Left 4th pereopod, remotor aspect; h, Same, dactyl and distal propodal spines, promotor aspect; i, Same, dactyl; j, Same, distalmost series of spines on flexor margin of dactyl; k, Same, distal propodal spines; l, Right 5th pereopod, remotor aspect; m, Same, dactyl and distal propodal spines, promotor aspect. (a, c, e, g, l, $\times 25$; b, d, f, h, i, k, m, $\times 62$; j, $\times 260$.)

about 11.5 mm); ovigerous female paratypes with carapace lengths of 2.1 and 2.2 mm.

Type-locality.—Bommie (reef) No. 2, west side of lagoon, Lizard Island, Queensland, Australia; 1–15 meters.

Habitat.—There are few data about the station at which the type-series of *Pseudocheles enigma* was taken except the mention of “clumps of *Isis* and assorted soft corals around the bottom of the bommie.” As the shrimp seems especially adapted for clinging to a marine plant or animal, this information about associated organisms may eventually prove to be meaningful.

Etymology.—The specific name is derived from the Latin neuter noun “aenigma,” a riddle or enigma, in reference to the puzzling systematic status of the species.

Systematic Discussion

We are in complete agreement with the decision of Forest (1977) to transfer the genus *Lucaya* Chace, 1939, from the Bresiliidae Calman, 1896, to the Disciadidae Rathbun, 1902, and the senior author regrets very much the circumstances that so long delayed the correction of his misassignment of that genus.

Pseudocheles conforms with the Bresiliidae, as restricted, and differs from the Disciadidae in having: (1) a small but distinct tooth on the ventral margin of the rostrum, (2) the proximal endite of the 1st maxilla nearly as long as the distal endite, (3) the endites of the 2nd maxilla rather widely separated and at least one of them strapshaped, (4) no distinct lash on the exopod of the 1st maxilliped, (5) the terminal segment of the 2nd maxilliped attached transversely rather than obliquely to the penultimate segment, (6) the terminal segment of the 3rd maxilliped relatively slender, not broadly flattened, and (7) the 1st pereopod not longer than the 2nd and with elongate fingers.

It agrees with the Disciadidae and differs from the Bresiliidae in (1) lacking a pterygostomian spine on the carapace and in having: (2) no more than 3 pairs of dorsolateral spines on the telson and (3) the posterior margin of that component convex or pointed rather than truncate, (4) the scaphognathite of the 2nd maxilla short and broad, (5) the terminal segment of the 2nd maxilliped armed with stout spines, (6) the 2 anterior pairs of pereopods with the ischium and merus fused, (7) the 1st pair of pereopods with the carpus very short and partially recessed in the excavate distal end of the merus when the appendage is extended, (8) all of the pereopods provided with exopods and (9) contiguous ventrally, thereby inhibiting the development of spines on the thoracic sternum, and (10) all 5 pleuro-branches well-developed.

Inasmuch as *Pseudocheles* combines many of the characters used by

Forest (1977:878) to distinguish the Disciadidae from the Bresiliidae, especially the spines on the "molar" process of the mandible (disciadid), the form of the endites of the 2nd maxilla (bresiliid), the form of the 3rd maxilliped (bresiliid), the fusion of the ischium and merus of the 2 anterior pairs of pereopods (disciadid), and the form of the carpus and of the distal end of the merus of the 1st pereopods (disciadid), the possibility of combining the Disciadidae with the Bresiliidae is clearly suggested. On the other hand, the form of the mandible and of the 1st and 2nd maxillipeds would seem to narrow the gap between the resulting family and the Oplophoridae Dana, 1852, thereby reinforcing the belief of Forest (1977:879) that *Bresilia* Calman, 1896, *Discias* Rathbun, 1902, and *Lucaya* are oplophoroid in nature. Perhaps even more disturbing is the revelation that the mandible and 2nd maxilliped of *Pseudocheles* are remarkably reminiscent of those structures in the Pasiphaeidae Dana, 1852, but the other mouthparts are so distinctly different that no consideration of that relationship can be entertained.

After considerable indecision about the relative merits of proposing another monogeneric family—characterized by an undivided mandible and spurious chelae on the 3 posterior pairs of pereopods—or of accommodating the genus in the revised family Bresiliidae (combined with the Disciadidae), we have finally selected the second choice as, hopefully, the most likely means of contributing to the eventual definitive classification of the Caridea. The reduction of the branchial complement of the bresiliid pereopodial somites to pleurobranchs alone (see partial review of caridean branchial formulae in Thompson, 1967:315, Table I) seems to be sufficient reason to separate that family from the Oplophoridae. The relative importance of a character of this kind probably varies from family to family and can be determined satisfactorily only when the evidence from the study of caridean larval characters is more nearly completed. In the meantime, the assignment of the Bresiliidae to the superfamily Oplophoroidea or to a separate superfamily must be a largely subjective decision.

The revised concept of the family Bresiliidae may be defined as follows: Mandible with palp; 2nd and 3rd maxillipeds and at least 1st and 2nd pereopods bearing well-developed exopods; 1st pereopod more robust than 2nd; gills on pereopodal somites consisting of pleurobranchs only.

Key to the Genera of the Family Bresiliidae

1. Rostrum armed ventrally with at least 1 small tooth; 2nd maxilla with endites widely separated, at least 1 strapshaped; 1st maxilliped without exopodal lash; 2nd maxilliped with terminal segment attached transversely to preceding segment; 3rd maxilliped with terminal segment slender, not flattened; 1st pereopod no longer than 2nd, with elongate fingers

- Rostrum unarmed ventrally; 2nd maxilla with endites partially overlapping, none strapshaped; 1st maxilliped with distomesial lash on exopod; 2nd maxilliped with terminal segment attached obliquely to preceding segment; 3rd maxilliped with terminal segment broad, flattened; 1st pereopod longer than 2nd, fingers short and stout 3
- 2. Carapace with pterygostomian spine; telson posteriorly truncate, armed with 5-11 pairs of dorsolateral spines; antennal scale broad distally, blade far overreaching distolateral tooth; mandible with incisor and "molar" processes deeply separate; 1st and 2nd pereopods with ischium and merus distinct, not fused; 1st pereopod with carpus as long as broad, not partially recessed in distal end of merus; 3 posterior pairs of pereopods conventional, not chelate; exopods on 1st and 2nd pereopods only *Bresilia*
 - Two species: *B. atlantica* Calman, 1896, from the North Atlantic southwest of Ireland, 1,200-1,400 m, and *B. corsicana* Forest and Cals, 1977, from the Mediterranean Sea east of northern Corsica, 450 m.
- Carapace with antennal spine only, without pterygostomian spine; telson posteriorly acute, armed with 3 pairs of dorsolateral spines; antennal scale narrowing distally, blade not overreaching distolateral tooth; mandible without deep division between incisor and "molar" processes; 1st and 2nd pereopods with ischium and merus fused; 1st pereopod with carpus broader than long, partially recessed in distal end of merus; 3 posterior pairs of pereopods spuriously chelate; exopods on all 5 pereopods *Pseudocheles*
 - One species: *P. enigma* (see above)
- 3. Rostrum not reaching level of distal segment of antennular peduncle; 3rd abdominal somite not forming gibbous cap over base of 4th somite; 3rd maxilliped with terminal segment distally lanceolate; 1st pereopod with dactyl semicircular; 3 posterior pairs of pereopods with ischiomerale suture well-marked *Discias*
 - Five species, associated with sponges in all tropical and some temperate seas (see Bruce, 1976).
- Rostrum reaching level of distal end of antennular peduncle; 3rd abdominal somite forming gibbous cap over base of 4th somite; 3rd maxilliped with terminal segment obliquely truncate distally; 1st pereopod with dactyl not semicircular; 3 posterior pairs of pereopods with ischiomerale suture somewhat obscure *Lucaya*
 - One species: *L. bigelowi* Chace, 1939, from the western North Atlantic off the Bahamas and Bermuda, pelagic to a possible depth of 4,773 m (see Chace, 1940:189 and Forest, 1977).

Literature Cited

- Bruce, A. J. 1976. *Discias mvitae* sp. nov., a new sponge associate from Kenya (Decapoda Natantia, Disciadidae). *Crustaceana* 31(2):119-130, 5 figs.
- Calman, W. T. 1896. On deep-sea Crustacea from the south west of Ireland. The Transactions of the Royal Irish Academy 31(1):1-22, pls. 1, 2.
- Chace, F. A., Jr. 1939. Preliminary descriptions of one new genus and seventeen new species of decapod and stomatopod Crustacea. Reports on the scientific results of the First Atlantis expedition to the West Indies, under the joint auspices of the University of Havana and Harvard University. *Memorias de la Sociedad Cubana de Historia Natural* 13(1):31-54.
- . 1940. The bathypelagic caridean Crustacea. Plankton of the Bermuda Oceanographic Expeditions. IX. *Zoologica*, New York Zoological Society, 25(2): 117-209, 64 figs.
- Chace, F. A., Jr., and R. B. Manning. 1972. Two new caridean shrimps, one representing a new family, from marine pools on Ascension Island (Crustacea: Decapoda: Natantia). *Smithsonian Contributions to Zoology* 131:18 pp., 11 figs.
- Dana, J. D. 1852. *Conspectus Crustaceorum quae in orbis terrarum circumnavigatione, Carolo Wilkes e classe reipublicae foederatae duce, lexit et descripsit*. Proceedings of the Academy of Natural Sciences of Philadelphia 1852:10-28.
- Forest, J. 1977. Un groupement injustifié: la superfamille des Bresilioida. Remarques critiques sur le statut des familles réunies sous ce nom (Crustacea Decapoda Caridea). *Bulletin du Muséum National d'Histoire Naturelle* (3)475, *Zoologie* 332:869-888, 14 figs.
- Forest, J., et P. Cals. 1977. Une deuxième espèce du genre *Bresilia* Calman, *B. corsicana* sp. nov. Comparaison avec *B. atlantica* Calman (Crustacea Decapoda Bresiliidae). *Bulletin du Muséum National d'Histoire Naturelle* (3)453, *Zoologie* 316:549-565, 20 figs.
- Holthuis, L. B. 1955. The Recent genera of the caridean and stenopodidean shrimps (Class Crustacea, Order Decapoda, Supersection Natantia) with keys for their determination. *Zoologische Verhandelingen Uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden* 26:157 pp., 105 figs.
- . 1973. Caridean shrimps found in land-locked saltwater pools at four Indo-West Pacific localities (Sinai Peninsula, Funafuti Atoll, Maui and Hawaii islands), with the description of one new genus and four new species. *Zoologische Verhandelingen Uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden* 128:48 pp., 13 figs., pls. 1-7.
- Rathbun, M. J. 1902. *Brachyura and Macrura*. Papers from the Hopkins Stanford Galapagos Expedition, 1898-1899. VIII. Proceedings of the Washington Academy of Sciences 4:275-292, 4 figs., pl. 12.
- Thompson, J. R. 1967. Comments on phylogeny of section Caridea (Decapoda Natantia) and the phylogenetic importance of the Oplophoroidea. Proceedings of Symposium on Crustacea, Marine Biological Association of India—part I: 314-326, 1 fig.

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